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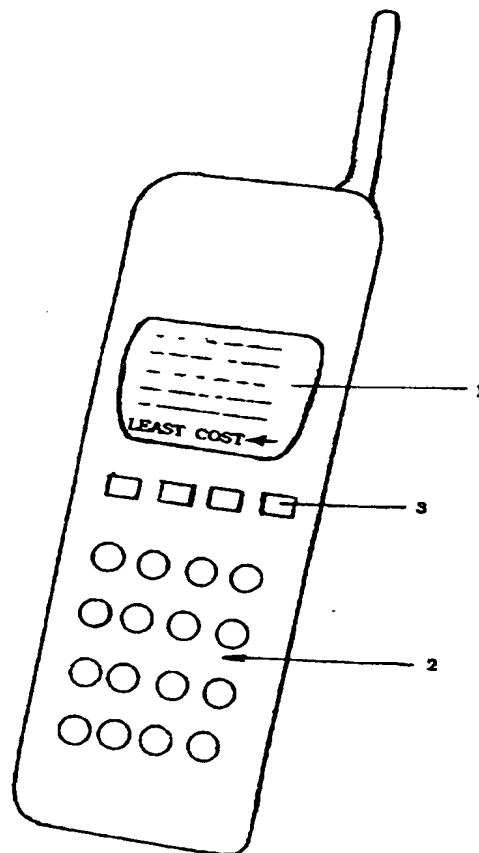
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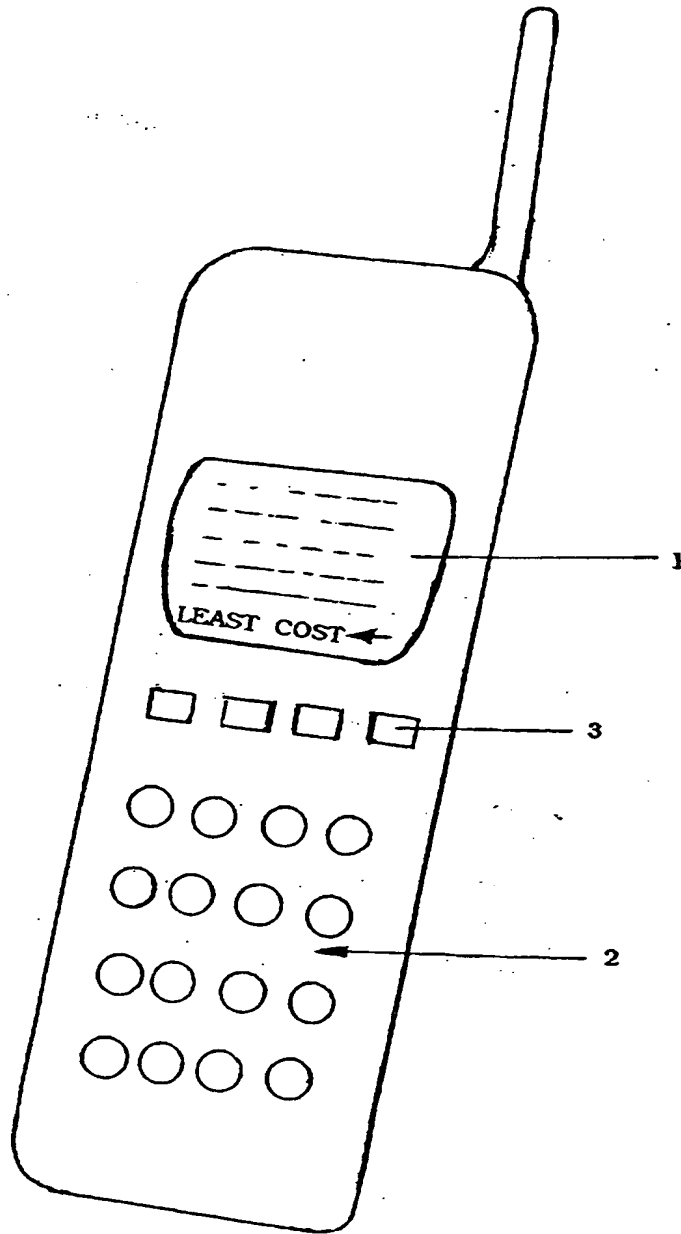
User configured network selection for dual mode radiotelephone

(57) A dual mode radiotelephone operable in cellular and satellite networks can be configured by a user so that set performance and cost criteria are used as the basis for network selection. The radiotelephone has a memory storing data providing the basis for selection which includes historical, timed records of charges for calls made previously from the radiotelephone. The criteria may be entered independently, e.g. urban or rural location, indoor or outdoor location or options, such as Least Cost or Best Signal, may be selected to automatically set the criteria. In addition to previous call charges, historical, timed records of previous signal quality may be stored and used when determining Least Cost or Best Signal options. Network availability can be checked periodically and indicated to a user by visual 1 or audible means and connection to the selected network can be automatic or user controlled. Network switching may be delayed if a minimum time of call charge applies or if blocks of time are charged.



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Selection mechanism for dual mode cellular/satellite hand sets

This invention relates to radiotelephone hand sets and in particular it relates to hand sets capable of operating with a terrestrial cellular network and capable also of operating with a satellite network.

Radiotelephone hand sets for operation with both cellular networks and satellite systems are being produced. Typical of such radiotelephones which are referred to herein as "dual mode" radiotelephones is a hand set capable of use with both the European GSM networks and the Intermediate Circular Orbit (ICO) satellite system.

Users in a particular geographical location will customarily mainly use the network most suitable for their purposes within their locality, the so called "home network". The choice of networks may be affected by many factors including the coverage and the costs attached to use of a particular network.

The extent of coverage may be considered as being the area within which a sufficiently strong communication can be established between the user's handset and the network to provide at least a minimum service. With regard to a particular user, however, the provision of a high quality communication link in a limited area, or even in a relatively few locations, may be more important than a wider but more variable coverage.

The area within which a user of e.g. a GSM radiotelephone may operate is considerable and is not limited to the home network but may be used on

many other networks across Europe and beyond. Use of a handset outside the home network is known as "roaming".

It is the aim of satellite operators effectively to provide a worldwide coverage. Nevertheless in the same way that the cellular system networks experience difficulties with coverage satellite operators also suffer from considerable variations in signal strength and from interference.

Despite these difficulties a user suitably equipped with a dual mode radiotelephone as described above might expect to have a greatly enhanced roaming capability. In view of the very high cost of establishing the satellite networks, the call tariff for the use of communications via the satellite networks would be expected to be significantly greater than when communicating via the terrestrial cellular networks. Owing to the high level of competition in the communications market, however this may not always be the case.

The user of the dual mode radiotelephone will have therefore, a choice of networks, the selection of which at any time will depend on a number of factors as mentioned above. The quality of received signals will vary with time and will depend *inter alia* on the location of the radiotelephone handset receiving the signals.

The selection of a particular network by the user of a dual mode radiotelephone is at present made by trial and error. For example a preferred "primary" network might be the home network on grounds of cost

and a satellite network may be the secondary option. The home network will be tried and if no service is available from the primary network then the radiotelephone will be switched by the user to interrogate the secondary, satellite network for service availability. If the search of the secondary network confirms availability then the radiotelephone user would normally start to communicate on the secondary network. The user would, under these circumstances, be most likely to continue to communicate on the secondary network regardless of the possibility of the primary network becoming available while use of the secondary network continues.

A feature of an arrangement to be described below, by way of example in illustration of the present invention is the provision of a dual mode radiotelephone with an improved means of network selection and updating.

In a particular arrangement to be described, by way of example, in illustration of the invention a dual mode radiotelephone which is capable of operation with both cellular and satellite networks, is configurable by the user to provide historical timed records of calls previously made from the radiotelephone which are to be used as the basis for the selection of a preferred telephone network for communication with the radiotelephone.

The radiotelephone, when in operation with a first network, is periodically triggered to check for service availability of a second network, and on the basis of a pre-determined set of criteria to select a preferred network from the first and second networks.

One arrangement which is for use in illustrating the invention will now be described with reference to the sole figure of the accompanying drawing which shows diagrammatically a front view of a dual mode radiotelephone. With reference to the figure, the dual mode radiotelephone shown has a display unit **1** and a keypad **2**. Included in the keypad **2** is set of function keys **3**. The function keys **3**, when pressed, activate various features e.g. the display of voice mail text messages. In this example the function keys have also the feature of providing a means for allowing the user to set or change at least some of the criteria for network selection.

One option available to the user is the default option which, once selected, will operate without further intervention by the user. Another option is to switch off the network selection facility and subsequently switch manually between networks.

In order to set the network selection facility each criterion is, in turn, displayed on display **1** and selected by means of the function keys **3**. Each criterion may be entered independently e.g. urban or rural location, outdoor or indoor location. Alternatively choices offered on the display are LEAST COST or BEST SIGNAL to provide automatically sets of criteria to allow a particular user preference to be met.

When the network selection facility has been set and subsequently the radiotelephone is switched on ready for use (power up) the search for networks begins and operates in accordance with the criteria entered by the user via the display **1** and function keys **3**.

In one set of criteria, the selection of a secondary network may be barred completely during certain times related to tariff cost whether or not a primary network is available during those times. In another set of criteria signal quality may be paramount regardless of cost and the use of the primary or of the secondary network may be inhibited until a certain signal strength or signal quality indication is achieved on one of the networks.

The result of the search for networks, once completed in accordance with the pre-determined parameters, will be displayed on display 3 and the user has only to press the send button for communication with the network to begin.

In the circumstance where a secondary, less preferred network is used periodic searches for the availability of the primary network will continue. Once the availability of the primary network has been confirmed and the pre-determined criteria have been met then an indication of primary network availability will be indicated to the user. The indications to the user are a visual indication via display 3 and an aural indication by means of a recognizable tone or jingle at the earpiece.

In addition to the visual and aural indication and if previously determined by the user configuration, the radiotelephone will end the communication with the secondary network and commence communication with the primary network. Alternatively on receipt of the visual and aural indicators,

the user will end the communication with the secondary network and call the primary network in the normal manner via the keypad.

A decision to switch automatically from one network to another may be affected by a minimum time of call tariff charge such that switching would not proceed, *certeris pluribus*, until the minimum call time had elapsed. Similarly where blocks of time are charged a delay may be introduced to avoid switching within a time block and a delay may also be included to avoid excessive switching from one network to another. For situations where cost is of particular importance automatic switching between networks may be prompted at the time when a first network tariff becomes more favourable with respect to a second network tariff.

A considerable amount of information can be stored presently within radiotelephones and the amount of detailed information recorded within radiotelephones is likely to increase. Historical, timed records of charges and signal quality for calls made previously from the radiotelephone may be used to support a decision attempting to secure the LEAST COST or BEST SIGNAL options when selected.

When the LEAST COST option is configured by the user the network selection process includes the use of data stored in a memory within the radiotelephone. Following a check for network availability, the stored call data is accessed and a search in an increasing timing frame around the time of the instant proposed call (e.g. Tuesday at 3.25 p.m.) will locate nearest equivalent calls made previously on the networks of interest. The timing

frame for this example starts at 3.25 p.m. plus and minus three minutes i.e. any calls between 3.22 and 3.28 will be regarded as equivalent calls. If no equivalent calls are recorded as between 3.22 and 3.28 then the timing frame is extended to plus or minus 6 minutes then to 12 minutes and then to 24 minutes. If no equivalent calls are located in the plus and minus 24 minute frame then the programmed default tariff information is used. The charges for the nearest equivalent calls on each network are then compared and the least cost network identified.

The average length of time for equivalent calls is taken as the likely duration of the proposed call and tariff changes occurring during the expected duration of the call and likely to affect the call may, in this manner, be foreseen. An estimate of lowest cost over the duration of the proposed call is made and least cost network selected. Switching between networks automatically during the call to achieve minimum cost will be inhibited by the time delay to prevent excessive switching as mentioned above.

Records of signal quality of the previous calls during the time of the proposed call are also accessed and a forecast of unacceptable loss of signal quality during the proposed call will cause de-selection of the affected network.

It will be understood that, although particular arrangements have been described, by way of example in illustration of the invention, variations and modifications thereof, as well as other embodiments may be conceived within the scope of the appended claims.

CLAIMS

1. A dual mode radiotelephone capable of operation with both cellular and satellite networks, and being configurable by the user to set performance and cost criteria to be used as the basis for the selection of a preferred telephone network for communication with the radiotelephone, including a memory for use in storing data for use in the selection process, the data stored in the memory and providing the basis for the selection including historical, timed records of charges for calls previously made from the radiotelephone.

2. A dual mode radiotelephone as claimed in claim 1 which is configurable by the user such that when in operation with a first network, periodical checks are made for the service availability of further networks.

3. A dual mode radiotelephone as claimed in either claim 1 or claim 2 including means for indicating to the user the result of the network selection.

4. A dual mode radiotelephone as claimed in claim 3 in which the indication of the result of the network selection is given to the user is on a display screen.

5. A dual mode radiotelephone as claimed in claim 3 in which the indication of the result of the network selection is given to the user by aural tones or jingles.
6. A dual mode radiotelephone as claimed in claim 1 which is configurable by the user to cause communication to begin automatically following the successful selection of a network.
7. A dual mode radiotelephone as claimed in claim 2 which is configurable by the user such that when a network, other than the first network, is selected as the preferred network the radiotelephone automatically begins communication with the preferred network and ceases communication with the first network.
8. A dual mode radiotelephone as claimed in any one of the preceding claims in which data stored in the memory within the radiotelephone includes historical, timed records of signal quality for calls made previously from the radiotelephone.
9. A dual mode radiotelephone as claimed in any one of the above claims configurable by the user as the LEAST COST for a proposed call.
10. A dual mode radiotelephone as claimed in any one of the preceding claims configurable by the user as the BEST SIGNAL for a proposed call.

11. A dual mode radiotelephone as claimed in any one of the preceding claims configurable by the user as being at an outdoor location for a proposed call.

12. A dual mode radio telephone as claimed in any one of the preceding claims configurable by the user as being at an indoor location for a proposed call.



Application No: GB 9900966.4
Claims searched: 1-12

Examiner: Anita Keogh
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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.Q): H4L (LDSC, LDSHE, LECX, LECC)

Int CI (Ed.6): H04Q (7/32, 7/38)

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB2285555 A (NOKIA) see particularly page 5 lines 16-26, page 6 lines 17-24, page 7 line 1 to page 8 line 2, page 21 lines 15-18	2-10
Y	WO 96/24229 A1 (McGREGOR et al.) pages 1-5	1 at least
Y	WO 95/17077 A1 (SAINTON) see particularly page 3 line 25 to page 4 line 16, page 10 lines 8-20, page 12 lines 1-6, page 32 line 12 to page 36 line 15	1-10
Y	US 5631947 (WITTSTEIN et al.) see abstract	1 at least
Y	JP090121241 A - see WPI abstract, accession no. 011330631 and JAPIO abstract, accession no. 055064411	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.